

of the 28th a trough of low pressure extended from Lake Erie southeastward to the New Jersey coast. At that time the pressure over the Lower Lake region, New England, the Middle Atlantic States and North Carolina ranged from 0.50 to 0.70 below the normal. By afternoon the area had passed southeastward off the Virginia coast. The signals in the Lake region were all lowered during the day, having been fully justified, maximum wind velocities having been reported at Duluth, 44 NE.; Milwaukee, 40 E.; Alpena, 35 E.; Toledo, 48 SW.; Oswego, 28 NE. The signals from Wood's Holl southward along the Atlantic coast to Cape Henry, from Charleston to Jacksonville and at all Gulf stations were lowered in the morning, and from Boston northward to Eastport at midnight of the 28th, these signals were fully justified; the following maximum wind velocities having been reported Indianola, 40 S.; Cedar Keys, 42 SW.; Jacksonville and Charleston, 29, SW.; Cape Hatteras, 56 SW.; Chincoteague, 49 SE.; New York and Eastport, 30 NE.; Boston, 40 E. Brisk easterly winds continued on the New Jersey coast during the day, and the Cautionary Signals lowered the morning of the 28th were followed at midnight by Cautionary Off-shore Signals, from Sandy Hook southward to Cape Henry, and at the same time on the North Carolina coast; the Cautionary Signals were lowered at Smithville and Wilmington, and changed to Cautionary Off-shore Signals from Macon to Kittyhawk. These signals were continued until the 31st in connection with high area No. XII. After leaving the North Carolina coast on the 28th this storm evidently moved northeastward inducing, in connection with high area No. XII., the brisk to high northerly winds, which continued to prevail along the Maine and Massachusetts coasts from the 28th until midnight of the 31st.

No. XVI.—This area appeared on the coast of British Columbia, midnight of the 26th, and moving slowly southeastward reached Utah the morning of the 29th and Kansas the 30th, Dodge City barometer at midnight 0.36 below the normal; changing its course to the northeast, it was central the morning of the 31st in the Lower Missouri valley, Omaha barometer 0.35 below the normal. Cautionary Signals were then ordered for Grand Haven, Milwaukee and sections 1 and 3. Continuing its northeasterly course, by midnight of the 31st it passed into the region north of Lake Superior. The Cautionary Signals on Lake Michigan were lowered April 1st; justified by velocities of 26 E. and 40 W.

INTERNATIONAL METEOROLOGY.

Three International charts, Nos. IV, V and VI, accompany the present *Review*. They exhibit the meteorological conditions of the northern hemisphere and portions of the southern hemisphere for the months of *August*, 1878, and *February*, 1880. No. IV indicates the probable course of five of the principal storm-areas occurring over the North Atlantic Ocean during the month of *February*, 1880. Two of these, Nos. I and II, appear to have passed in a northeasterly course after arriving at the 40th meridian, and to have produced southerly gales along the British coasts in two or three days after leaving Newfoundland. The latter of these was encountered by the *Hibernian* on the 10th and 11th; this vessel reports on the 10th in 53° N. 28° W. heavy SE. gale, with heavy rain; 11th, 53° N. 30° W., barometer 28.15, terrific hurricane from SE. to NW. No. III appears to have slowly developed during the 8th in the southwest quadrant of area No. I; on the 9th and 10th it was encountered by the ship *Iron Cross* in about 40° N. 16° W. This vessel reports "on the 9th, at 4 p. m., in 42° N. 16° W., barometer 29.45, wind veering from SSW. to NW; at 11 p. m. a heavy NW. gale commenced, which reached its maximum force about 2 a. m. of the 10th, squalls of nearly hurricane force of 15 minutes duration occurring about every 30 minutes; the barometer rose from 29.48 at 8 p. m. of the 9th to 30.51 at 8 a. m. of the 11th, when the vessel was in 37° N. 17° W." No. IV appeared over mid-ocean on the 12th, and from the 13th to the 18th remained, as an extensive area of remarkably low pressure, over the eastern half of the Atlantic. Steamers *Sardinian* and *Leipzig* report the following, barometer error of former vessel being about -0.35, of latter quite, small.

| 1880. | Steamship <i>Sardinian</i> . | | | | Steamship <i>Leipzig</i> . | | | |
|---------------|------------------------------|--------|------------|---------|----------------------------|--------|------------|---------|
| | Lat. | Long. | Barometer. | Wind. | Lat. | Long. | Barometer. | Wind. |
| February 15.. | 54° N. | 20° W. | 28.20 | SSE. 0. | 50° N. | 12° W. | 28.92 | SW. 6. |
| " 16.. | 58° N. | 25° W. | 28.00 | ENE. 6. | 49° N. | 16° W. | 28.86 | NW. 5. |
| " 17.. | 51° N. | 32° W. | 28.68 | NNE. 6. | 49° N. | 19° W. | 28.74 | WNW. 7. |
| " 18.. | 49° N. | 40° W. | 28.75 | N. 7. | 49° N. | 23° W. | 28.77 | W. 6. |

The following remarks accompany the observations forwarded by the *Sardinian*:—"On February 15th, 16th and 17th, the barometer read from 28.00 to 28.50, the wind, at times, gaining a force of 7 or 8 (Beaufort) to light and variable, and backing twice round from ESE. through NE. and N. to NW. and W.; on the 19th the barometer rose with a steady wind from N., force 7, 8, 6 and 4, thus restoring the equilibrium without any great force of wind. The sea, during this time, was very confused." No. V. developed during the 15th on the coast of North Carolina, and on the 16th and 17th moved rapidly eastward south of Nova Scotia. On the 15th it was encountered by Brig *George*, in 38° 26' N. 72° 48' W., which vessel reports as follows:—"On the morning of the 15th, from 12 midnight to 2 a. m., wind from NE. to E., moderate, but having the appearance of rain. From that time up to time of observation, (7:35 a. m., Washington mean time) baffling winds from ENE. to ESE. and even to SE., with heavy squalls of rain; at 10 a. m. wind

commenced to back to NNE. and set in in good earnest; at 2 p. m. took in foresail and reefed mainsail; at 4 p. m., wind N. heavy—12 midnight, NW. wind with heavy sea." On this chart will also be found the probable course of two storms encountered by the S. S. Gaelic over the North Pacific Ocean on December 22nd and 26th, 1879, respectively. During the storm of the 26th the barometer fell to 29.15, the gale commenced at SE. and veered to SW. and N., attaining a force of 11 (Beaufort) with a mountainous sea.

Chart No. V shows by isobaric and isothermal lines, the mean pressure and temperature, and, by small arrows, the prevailing direction of the wind, at 7:25 a. m., Washington mean time, over the northern and portions of the southern hemisphere for the month of August, 1878. The barometer observations have been corrected for temperature and reduced to sea level. At stations lying outside the area included within the lines and for those in the southern hemisphere the means are shown by figures indicating the temperature in degrees, Fahr., and the pressure in English inches. As compared with the preceding month (July, 1878) the pressure over the ocean-areas, (especially over the eastern portions) is decidedly lower: thus at St. Michael's and St. Paul's Island, Behring's Sea, the mean pressure fell from 29.78 and 29.82 to 29.69 and 29.78 while the means of the observations between 30 and 50 N. are also lower. Over the Atlantic the region of 30.30 entirely disappeared, the area of 30.10 which during July covered the greater part of the North Atlantic and the northeastern margin of which extended to Ireland and Land's End, diminished so that in August it was included between the parallels of 20 and 40 N. The area of low pressure over the northern portion of the North Atlantic, which during July was probably central to the north of Godthaab and Styk-kisholm, is found during August central between the parallels of 50 and 60 N., and probably about 20 W. The isobar 29.80 includes the greater part of the ocean between 48 and 51 N., and 30 and 10 W., the British Isles, the North Sea and portions of Denmark, Sweden and Norway. Over Western Europe and Asia the means show a general increase of pressure, and during the latter part of the month (August, 1878) northerly winds set in along the coast of China. The monthly rainfalls reported by the co-operating stations in Hindostan show an increase in amount at all stations, except Bombay, Poona, Allahabad and Chittagong; increase, 16.13 inches at Deesa and 6.27 at Goalpara. At Bombay the decrease is 28.15 inches.

On Chart No. VI are traced the paths of thirty of the principal storm-areas, which traversed the northern hemisphere during the month of August 1878. The general distribution of these tracks corresponds to that of low pressures, as shown on chart No. V. Among the most notable storms of the month the following may be mentioned. No. I, typhoon along the coast of China, from July 30th to August 1st; the lowest pressures were experienced at Nagasaki on the 2nd, with S. to WSW. winds, and at Tokio on the 3rd, with SSW. and SW. winds. At these stations the greatest daily velocities of the month were recorded during the passage of this area, namely, Nagasaki, on the 2nd, 506 miles and Tokio, on the 3rd, 260 miles; at the former station on the 1st a rainfall of 7.45 inches was recorded with SE. and S. winds. On the 5th, S. S. *Peking* in 35 N. 157 W. reports barometer 29.70, wind SSW., 41 miles, veering on the 6th, to N. by W. 25 miles. No. IX was accompanied by SW. gales along the coast of Alaska from the 1st to the 4th, the maximum velocity of the month, SW. 74 miles per hour, being registered at St. Michael's on the 2nd. No. XII, described in the *Monthly Weather Review* for August, 1878, as low area No. IV, was accompanied in its passage over the eastern portion of the United States by exceedingly severe thunder-storms, and by a destructive tornado at Wallingford, Conn. No. XVI, described as low area No. VIII, in the *Review* for August, 1878, which developed into a hurricane over the western portion of the Gulf of Mexico on the 16th and 17th. No. XVII, (No. VI, August *Review*), accompanied by severe gales on the 19th and 20th, from 35 N. to the Gulf of St. Lawrence, and between the meridians of 55 and 61 W. No. XX was quite severe in the region of Hudson's Bay and Davis Straits, a vessel being driven ashore on the west coast of Hudson Bay during a heavy NE. gale on the 23rd, and on the 25th meteorological observations on board the Schr. *Florence* in Davis Straits were omitted on account of "heavy storm." No. XXI over the East Atlantic on the 18th and 19th. No. XXV over the North Pacific on the 25th. No. XXVI, which progressed very slowly as a hurricane of great severity from the Bahamas to the Bermudas; it was encountered on the 25th in 26 N. 76 W., on the 26th, 29 N. 71 W., 27th, in 31 N. 71 W., on the 28th it passed over the Bermudas and on the 29th was encountered in 36° N., 55° W.

TEMPERATURE OF THE AIR.

The mean temperatures for March, 1880, are shown by the isothermal lines upon chart No. II. As is shown by the table of average temperatures on that chart the temperature was above the normal in all districts from the Mississippi valley eastward to the Atlantic ocean, except New England, St. Lawrence valley and Canadian maritime stations. In the Plateau and Rocky mountain districts, Missouri and Red River of the North valleys and on the Pacific coast the temperature was below the normal. The greatest excess of temperature prevailed in Florida, and the greatest deficiencies are reported from the Canadian maritime stations, 5°.9 below; Red River of the North valley, 5°.1 below; Portland, Or., 6°.6 below; North Rocky Mountain slope, 7°.3 below. The temperature has been unusually low from the northern half of the Pacific coast region eastward to the Red River of the North valley. The table of comparative temperatures for the several districts is printed on the right side of chart No. II.

Maximum Temperatures.—Maine: 56° at Portland. New Hampshire: 37° at Mt. Washington and 57° at *Dunbarton. Vermont: 53° at Burlington and 63° at *Charlotte. Massachusetts: 72° at Boston. Rhode Island: 60° at Newport. Connecticut: 69° at New Haven. New York: 70° at New York and 58° at Oswego. New Jersey: 73° at Barnegat; 74° at *Trenton, *Vineland and *New Lisbon. Pennsylvania: 75°